

STATEMENT OF WORK

Title of Project: Evaluation of intervention methods for reducing Musculoskeletal disorders (MSDs) among roofers. Phase 1: Evaluation of knee savers for construction roofers

The services contemplated under this contract are considered to be an “Other Functions” as defined by the Office of Federal Procurement Policy in OFPP letter 11-01 and by HHS in Acquisition Policy Memorandum 2012-01.

C.1 Background and Need –

Construction roofing workers suffer from both fatal and nonfatal musculoskeletal injuries. One-third of fall-related fatal injury cases in construction are reported from roofing related activities. Residential roofers typically spend more than 75% of their work time in stooping, crouching, kneeling and crawling postures, which require constant bending and twisting of workers’ bodies. These awkward postures combined with the excessive musculoskeletal loading required to maintain balance when working on slanted surfaces can lead to MSDs in the low extremity. Several devices have been developed to reduce these exposure factors; however, their effectiveness has not been sufficiently evaluated on a strict biomechanical basis. This project is designed to evaluate the effectiveness of two typical intervention methods. In phase 1 of this study, typical knee savers for reducing the loads and awkward postures of the knee joints will be evaluated.

The evaluation requires the measurements and analyses of some biomechanical and psychophysical responses, which include the contact pressure between the knee savers and lower limbs, the dynamic stability of the human body, tolerable kneeling time, kinematics of the lower limbs, and the EMG of major muscles of the lower limbs. While we have some knowledge and experiences in the measurement and analyses of the contact pressure, kinematics, and EMG, we have not conducted the other measurements and analyses. We need experienced researchers to help us conduct the experimental study. The consultations on the experimental design and participation in the experiments will not only help us appropriately carry out the experiments and analyses, but also accelerate our learning process.

C.2 Project Objective – The objective this study is to evaluate the effectiveness of typical knee savers for construction roofers in reducing the MSDs.

C.3 Scope of Work

This project will conduct a series of human subject experiments according to the approved NIOSH human subject test protocol. The evaluation of the intervention effectiveness will be accomplished by measuring and analyzing the following biomechanical and psychophysical responses:

- (1) **Contact pressure between the knee savers and lower limbs.** Flexible pressure sensors (Tekscan or Novel pressure sensor matrices) will be used to measure the interface contact pressure.

- (2) **Dynamic stability.** The body's dynamic stability will be evaluated before and after kneeling work.
- (3) **Tolerable kneeling time.** Tolerable kneeling time for each device under a given test condition will be measured. Subjective discomfort will also be recorded via questionnaire during the experiment.
- (4) **Kinematics of the lower limbs.** To measure the kinematics of the body, a total of 18 reflective spherical markers will be placed on the lower extremities of each subject, at the anatomical landmarks. The variations in the joint angles due to the use of knee savers will be evaluated.
- (5) **The EMG data of major muscles of the lower limbs.** They are associated with the use the selected knee saver products and they will be measured during the experiments.

The experimental methods, data processes, results, and preliminary analyses and discussions will be documented in a technical report.

C.4 Technical Requirements –

The researchers should provide the required consultation services and they should meet the following technical requirements:

- (1) They have good knowledge and experiences in the measurements and analyses of the above-mentioned five types of biomechanical and psychophysical responses, which may be proved from their publications or their graduate students' theses.
- (2) They have conducted some experimental studies on the ergonomics of roofing workers, which may also be proved from their publications or their graduate students' theses.
- (3) They should be able to provide direct guidance on the study by participating in the preparation and experiments in our human motion experiment lab.
- (4) They will provide a technical report on the scientific evaluation of the effectiveness of typical construction roofers' knee savers for reducing the loads and awkward postures of the knee joints.

C.5 Reporting Schedule –

The final written report will be delivered on/before December 31, 2016.

C.6 Government Furnished Property

Not applicable.

C.7 References –

Not applicable.

Deliverables:

1. The vendor will provide informal reports as to progress or unanticipated technical issues on a bimonthly basis by oral communication with NIOSH scientists.
2. A written final report is required. This report should include a statement of the problem, a list of project aims, description of methods used, statistical analysis, summary of results, and conclusions.

C.8. Payment Schedule

- The vendor will participate in the preparation and conduction of the experiments of this project. Upon the preparation of the experiments is complemented and the experiments with one of the subjects are completed, the vendor will be paid \$10,000, likely before May 31, 2016.
- Upon receiving the final report, the vendor will be paid \$10,000.